PERFORMANCE REPORT

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FEDERAL AID PROJECT F-221-M-6

INLAND FISHERIES DIVISION MONITORING AND MANAGEMENT PROGRAM

2015 Fisheries Management Survey Report

Falcon Reservoir

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July 31, 2016

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SURVEY AND MANAGEMENT SUMMARY

Fish populations in Falcon Reservoir were surveyed in 2014-2016 using electrofishing since the last report (July 2014). Anglers were surveyed from January through June 2016 with a creel survey. Historical data are presented with the 2015-2016 data for comparison. This report summarizes the results of the surveys and contains a management plan for the reservoir based on those findings.

- **Reservoir Description:** Falcon Reservoir (83,654 acres when full) borders Mexico and was constructed in 1954 on the Rio Grande River. The reservoir experiences extreme water level fluctuations due to variable rainfall and water releases for downstream agricultural irrigation. During the survey period (6/2014 to 5/2016), water level steadily increased inundating terrestrial vegetation. Flooded terrestrial vegetation was present in 39% of the Texas-side of the reservoir in September 2015.

- **Management History:** Fish harvest is regulated according to the standard statewide restrictions, except for Alligator Gar. The daily bag limit for Alligator Gar is 5 fish/day. On the Mexico side, fish harvest is unregulated and a substantial commercial gill net fishery exists targeting primarily Blue Tilapia, catfishes, and rough fish species. Florida Largemouth Bass (FLMB) fingerlings have been stocked annually in recent years to increase FLMB genetic introgression and in turn, Largemouth Bass trophy potential. Giant salvinia was found growing near a boat ramp in 2016 and was removed.

- **Fish Community**
    - **Prey species:** Gizzard Shad, Threadfin Shad, Bluegill, and Blue Tilapia are the primary forage species, and were present in sufficient quantity and size to support predator populations.
    - **Alligator Gar:** Population size and age structure for this species is excellent. The water body record was increased with a fish weighing 249 lbs. taken by bow fishing in 2014. From January to June 2016, anglers expended 1,668 h bow fishing for the species and harvested 187 Alligator Gar.
    - **Catfishes:** Blue Catfish is the predominant catfish species in the reservoir and their relative abundance has remained consistent in recent years. A new water body record was set for Blue Catfish with a fish weighing 60 lbs. taken by a rod and reel angler in 2016.
    - **White Bass:** Relative abundance of White Bass remained low. Although there was no angling effort directed at this species, 507 White Bass were incidentally caught and harvested.
    - **Largemouth Bass:** Relative abundance of Largemouth Bass has increased, recovering from low abundance in 2013-2014. The population is mostly comprised of fish <12 inches total length. From January to June 2016, 115,115 were caught by anglers, and one of every 14 fish, on average, exceeded 4.0 lbs.
    - **Black Crappie:** Relative abundance of Black Crappie remained low. From January-June 2016, anglers expended 1,342 h fishing for the species and harvested 676 Black Crappie.

Management Strategies: Concerning Largemouth Bass, stock FLMB annually, frequently monitor population, estimate genetic introgression of FLMB into the population, and explore via simulation model the potential effectiveness of alternative harvest regulations. Assess Alligator Gar population size and age structure to determine effects of daily bag limit increase. Monitor for presence of invasive aquatic species and conduct control activities as needed.

INTRODUCTION

This document is a summary of fisheries data collected from Falcon Reservoir in 2014-2016. The purpose of the document is to provide fisheries information and make management recommendations to protect and improve the sport fishery. While information on other fishes was collected, this report deals primarily with major sport fishes and important prey species. Historical data are presented with the 2014-2016 data for comparison.

Reservoir Description

Falcon Reservoir is a Texas-Mexico border impoundment constructed on the Rio Grande River. At conservation pool elevation, the reservoir encompasses 83,654 acres, with 38,360 acres located within Texas jurisdiction. The reservoir was completed in 1954 and was built for water conservation, flood control, hydroelectric energy, and recreation. Ownership of water is shared between Mexico (41%) and the U.S. (59%) and flows are managed by the International Boundary and Water Commission (IBWC) and Texas Commission on Environmental Quality according to the 1944 Water Treaty established between the two countries. The reservoir experiences dramatic water level fluctuations due to variable rainfall and downstream agricultural irrigation needs (Figure 1). Average annual water fluctuation is about 15 feet. Record low water level occurred in 2002 (54 feet below conservation pool elevation, CP) and record high water level occurred in 2010 (8 feet above CP). When water level recedes, dense terrestrial vegetation becomes established on the exposed reservoir bottom. These species include mesquite, retama, huisache, acacia, salt cedar, and various grasses, and when inundated are the predominant structural fisheries habitat. Aquatic vegetation rarely occurs in the reservoir due to the presence of a reproducing population of Grass Carp, presumably introduced into the Rio Grande system by Mexico. Other descriptive characteristics for the reservoir are in Table 1.

Angler Access

There are two public boat ramps (Zapata County Park and Falcon Lake State Park) and several private boat launches associated with motels and RV parks at the reservoir. Characteristics of the two public boat ramps are provided in Table 2. Shoreline angling access is limited to areas around the boat ramps. In late 2015, angler access to 1,000-3,000 acres of the reservoir became limited because of construction on the Highway 83 Bridge over the Veleno arm of the reservoir. The installation of an earthen levee paralleling the bridge prevented navigation under the bridge. Bridge construction, including removal of the levee, is scheduled to be completed in late 2017 (Figure 2).

Management History

Previous management strategies and actions: Management strategies and actions from the previous survey report (Myers and Dennis 2013) included:

1. Conduct additional electrofishing surveys to assess the Largemouth Bass population.
   Action: Additional surveys were conducted in fall 2014 and 2015, and in spring 2016.
2. Stock 500,000 FLMB annually.
   Action: A total of 502,052 and 462,885 FLMB were stocked in 2014 and 2015, respectively. The reduced number stocked in 2015 was due to re-allocation of fish to facilitate a high density FLMB stocking at Medina Reservoir.
3. Conduct 6-month creel survey in 2016, determine angler preferences regarding potential Largemouth Bass harvest regulation changes, and model effects of daily bag limit reduction to three fish.
   Action: The creel survey was completed June 2016. These data along with previous data will be used to estimate effects of lowering the daily bag limit and possibly other harvest regulation changes. Upon completion of analyses, harvest regulation alternatives, if appropriate, may be presented to anglers to receive feedback.
4. Conduct additional gill net survey to assess the White Bass population.
   Action: An additional gill net survey was not conducted due to development in 2015 of the

objective-based sampling plan for which creel surveys will be used to monitor White Bass in the reservoir.

5. Assess the Alligator Gar population and determine angler opinions concerning management of this species.
   Action: The assessment and angler opinion survey was completed in 2014, and as a result, the daily bag limit was increased from 1 fish to 5 fish/day in September 2015.
6. Monitor for presence of invasive species and conduct efforts to educate reservoir users of invasive species threats.
   Action: A vegetation/habitat survey was conducted in 2015 and no invasive plant species were found at that time. Invasive species awareness signs were installed at public boat ramps in 2015. Giant salvinia was found growing adjacent to the Zapata County Boat Ramp on May 24, 2016, and control actions were conducted.

Harvest regulation history: Except for Alligator Gar, all sport fishes have historically been managed with statewide regulations (Table 3). The Alligator Gar daily bag limit increased from 1 fish/day to 5 fish/day in September 2015. Fish harvest is unregulated by the Mexico government in Mexico waters of the reservoir.

Stocking history: Numerous fishes have been stocked into the reservoir, however only Florida Largemouth Bass and ShareLunker Largemouth Bass have been stocked since 2010. Annual stockings of FLMB have been conducted since 2010 to increase FLMB genetic introgression and in turn, Largemouth Bass trophy potential. The complete stocking history is in Table 4.

Vegetation/habitat management history: A small amount of Giant salvinia was found growing adjacent to the Zapata County Boat Ramp in May 2016 and was removed.

Water transfer: No interbasin transfers are known to exist.

METHODS

An objective-based sampling plan (OBS) was implemented for the reservoir in 2015. Sampling activities that followed were conducted to achieve survey and sampling objectives specified in the OBS. Primary components of the OBS plan are listed in Table 5. Sampling activities conducted prior to OBS implementation were conducted according to Myers and Dennis (2013) and TPWD Fishery Assessment Procedures (TPWD, Inland Fisheries Division, unpublished manual, revised 2015), except when otherwise indicated. All survey sites were randomly selected except when otherwise indicated (Appendix A).

Electrofishing – Largemouth Bass, sunfishes, Gizzard Shad, and Threadfin Shad were collected during day-time by electrofishing (24, 5-min stations) during fall. Only Largemouth Bass were collected during spring, daytime electrofishing (24, 5-min stations). Catch per unit effort (CPUE) for electrofishing was recorded as the number of fish caught per hour (fish/h) of actual electrofishing. Ages for Largemouth Bass were determined using otoliths from 12 randomly-selected fish (range 13.0 to 14.9 inches) collected in spring 2016.

Gill netting – Catfishes and White Bass were collected by gill netting (10 net nights at 10 stations). Catch per unit effort for gill netting was recorded as the number of fish caught per net night (fish/nn). Gill nets ranging in mesh size from 3.5 to 7.0 inches were used during April, June, August, and October in 2014 at biologist-selected stations to collect Alligator Gar to assess population size structure and growth. Ages for Alligator Gar were determined using otoliths from 10 fish/10 cm size group and according to Buckmeier et al. (2012). A von Bertalanffy growth model was used to relate length to age for Alligator Gar (von Bertalanffy 1938).

Trap netting – Crappie were collected using trap nets at biologist-selected stations during winter. Varying sampling effort was used among years (8-16 total net nights). Catch per unit effort for trap netting was recorded as the number of fish caught per net night (fish/nn).

Genetics – Micro-satellite DNA analysis was used to determine genetic composition of individual fish from 2005 to present and by electrophoresis prior to 2005. Fish utilized for genetic analysis prior to 2011 were collected by electrofishing in fall. Fish, utilized in genetic analysis after 2011 and described as controls were randomly collected at bass tournament weigh-ins in fall and weighed <10 lbs. Those described as trophy were ≥10 lbs. and were voluntarily provided by anglers.

Statistics – Sampling statistics (CPUE for various length categories), structural indices [Proportional Size Distribution (PSD), terminology modified by Guy et al. 2007], and condition indices [relative weight (W_r)] were calculated for target fishes according to Anderson and Neumann (1996). Index of vulnerability (IOV) was calculated for Gizzard Shad (DiCenzo et al. 1996). Standard error (SE) was calculated for structural indices and IOV. Relative standard error (RSE = 100 X SE of the estimate/estimate) was calculated for all CPUE and creel statistics.

Creel survey –Sampling was conducted from January to June 2016 at the two primary access points. Sampling occurred on 10 random weekend days and 8 random weekdays per quarter. Each sample day was split into equal duration time periods, with random time period selection and 1 time period sampled per creel day. Selection of access point to sample was also random. Voluntary release rates were calculated as number of legally harvestable size fish released divided by the sum of number of harvested fish and legally-harvestable size fish released multiplied by 100 (Myers et al. 2008). Additionally, estimated weights of caught and released Largemouth Bass >14 inches were obtained from interviewed anglers to estimate number of fish released by weight category.

Habitat- Surveys were conducted using the random point sampling method during August/September (TPWD Inland Fisheries Division, unpublished manual, revised 2015). The last structural (i.e. shoreline substrate) habitat survey was completed in 2009, results of which can be found in Myers and Dennis (2013).

Water level- Source for water level data was the International Boundary Water Commission (IBWC 2016).

RESULTS AND DISCUSSION

Habitat: Flooded terrestrial vegetation (huisache, mesquite, acacia, and salt cedar) was the primary fisheries habitat in the reservoir, and its quantity varied with water level. On the Texas side of the reservoir, percent occurrence ranged from 22 to 68% since 2009 and in 2015 was 39% (Table 6). The reservoir contains abundant Grass Carp. These are presumed to have originated from diploid stockings into the reservoir and the Rio Grande watershed conducted by Mexico authorities. As such, no aquatic vegetation has been documented occurring in the reservoir since the early 1990s. However, a small amount of Giant salvinia was found growing adjacent to the Zapata County Boat Ramp in May 2016. Upon discovery, all plants were physically removed. Thereafter, surveys of the infested area were conducted weekly and plants were removed. Also, a containment boom 400 feet in length was temporarily deployed around the boat ramp to prevent the plant from being redistributed by wind and wave action.

Creel: Fishing for Largemouth Bass continued to comprise the majority of the total fishing effort expended on the reservoir (91.7%; Table 7). Other species targeted by anglers in 2016 included catfishes (3.5%), Black Crappie (1.1%), and Alligator Gar (1.4%). Total angling effort expended on the reservoir was slightly greater in 2016 (119,634 h) than in 2011(108,427 h) and more than double that in 2006 (50,939 h; Table 8). Total directed angling expenditures were similar in 2016 ($1,209,834) and 2011 ($1,289,845).

Prey species: Electrofishing CPUE of Gizzard Shad was greater in 2015 (60.0 fish/h) than in 2013-2014 (9.0-16.5 fish/h; Figure 3). Gizzard Shad IOV was 24 in 2015. Electrofishing CPUE of Threadfin Shad was 77.0 fish/h in 2015 (Appendix B). Electrofishing CPUE of Bluegill remained low ranging from zero in 2013 to 5.5 fish/h in 2015 (Figure 4). Blue Tilapia and crayfish also important prey species in the reservoir. However, relative abundance of Blue Tilapia could not be determined because of low susceptibility of this species to electrofishing. Rapid growth of predator species (see below) and mean relative weights exceeding 80 for most size classes of Largemouth Bass (see below) suggest prey availability was sufficient for predator fish populations.

Alligator Gar: A total of 362 Alligator Gar ranging in length from 40 to 88 inches and in weight from 16 to 215 lbs. were captured during 2014 (Figure 5). Collected fish ranged in age from 1 to 56 years old, ages of fish generally coincided with years during which water level increased. Alligator Gar experienced rapid growth with females attaining 6 feet in total length at 10 years of age (Figure 6). The water body record for this species increased to 249 lbs. with a fish taken by bow fishing in 2014. An estimated 187 Alligator gar were harvested from January to June 2016 (Table 9). A total of five fish were observed harvested during creel sampling with total length measurements taken on two fish (61 and 62 inches). Anglers expended an estimated 1,668 h targeting this species and all were bow fishing.

Catfishes: Gill net CPUE of Blue Catfish (Figure 7) in 2014 (8.1 fish/nn) was similar in 2012 (10.8 fish/nn) and 2010 (8.7 fish/nn). However, gill net CPUE of stock-size fish was substantially less in 2014 (1.6 fish/nn) and 2012 (1.7 fish/h) than in 2010 (6.2 fish/nn) indicating the population was dominated by young, sub-legal length individuals. The water body record increased to 60.0 lbs. for Blue Catfish with a fish taken by rod and reel in 2016. Gill net CPUE of Channel Catfish was low (0.2-2.9 fish/nn) in 2010, 2012, and 2014 (Figure 8). Population size structure of Channel Catfish remained poor with length frequency distribution modal peaks at less than 12 inches. Directed angling effort for catfishes was slightly lower in 2016 (4,224 h) than in 2011 (5,213 h) and much lower than in 2006 (8,308 h; Table 10). Angling success rate declined in 2016 compared to previous years with anglers catching 0.83 catfish/h of angling effort, on average. Likewise, angler harvest for both Blue and Channel catfishes (2,111 fish) was lower in 2016 compared to previous years (12,541-14,776 fish). In 2016, most of the harvested Blue Catfish and Channel Catfish were <18 and <14 inches, respectively (Figure 9).

White Bass: White Bass were first collected in gill nets in 2014 after not having been collected since 1995 due to the effects of an extended low water period in conjunction with intense Mexican commercial netting. Gill net CPUE was 0.5 fish/nn in 2014 (Figure 10). No angling effort specifically directed towards White Bass occurred during the 2016 creel survey period (Table 11). However, an estimated 507 White Bass were incidentally caught and harvested by anglers targeting other species. These harvested fish ranged in size from 10 to 13 inches (Figure 11). Twenty percent of legal length White Bass (>10 inches) caught were voluntarily released.

Largemouth Bass: Electrofishing CPUE of Largemouth Bass increased from 2013 to 2016 (Figures 12 and 13). The most recent fall CPUE estimate (2015) was greater than any of the previous estimates made since 2005 (Figure 14). Similarly, the most recent spring estimate (2016) was among the highest estimates made since 2007. Population abundance has largely recovered from the depressed condition described in Myers and Dennis (2013) that occurred in 2013-2014. This recovery was attributable to increasing water level beginning in 2014, a concomitant improvement in fisheries habitat, and production of a strong year class in 2015. The majority of fish in the current population are <12 inches. Proportional stock distribution was 29 in fall 2015 and 52 in spring 2016. Mean relative weights were acceptable with most size-category specific values exceeding 80. Largemouth Bass exhibited rapid growth obtaining legal-harvestable length in two growing season (Myers and Dennis 2013). Fish ranging from 13 to 15 inches total length collected in spring 2016 (N = 12) were all 2015 year class fish. These were likely the fastest growing individuals of the 2015 cohort. Angling effort directed toward Largemouth Bass was greater in 2016 (110,930 h) than in previous years (42,472-99,654 h; Table 12). Tournament angling accounted for 20% of total Largemouth Bass angling effort. Angling success was good in 2016 with anglers catching 1.02 fish/h of angling effort, on average. Non-tournament anglers harvested 4,689 fish in 2016 which is substantially less than in 2011 (19,196 fish) and 2006 (9,839 fish). The length distribution of harvested fish in 2016 was similar to previous years; Fish ranging in size from 15 to 16 inches were most frequently harvested (Figure 15). Voluntary release of legal-length fish was substantially greater in 2016 (90%) than in previous years (54-78%). The majority of caught and released fish (93%) were <4.0 lbs. However catch of quality size fish (>4.0 lbs) remained very good. On average, one of every 14 fish caught and released was >4.0 lbs. Genetic introgression of FLMB into the population has been high at the reservoir ranging from 52 to 84% percent FLMB alleles (Table 13). Analyses conducted in 2011 showed similar average introgression for trophy size (>10 lbs) and control fish. However, a positive correlation was found between minimum introgression value by weight class and weight class suggesting that an increase in minimum introgression values through additional stockings may yield greater overall trophy potential (Myers and Dennis 2013).

Black Crappie: Trap net CPUE of Black Crappie remained low at 1.3 fish/nn in 2013 (Figure 16). Angling effort directed towards Black Crappie remained low in 2016 (1,342 h), however it was greater than in 2011 (Table 14). Despite the increase in angling effort, harvest was considerably lower in 2016 (676 fish) than in 2011 (2,651). Forty-two percent of the legal-length fish caught were released. This high voluntary release was attributable to release of incidental catches of Black Crappie by anglers targeting other species. Length of harvested Black Crappie ranged from 10 to 13 inches in 2016 (Figure 17).

Fisheries management plan for Falcon Reservoir, Texas

Prepared – July 2016.

ISSUE 1: Falcon Lake has been consistently ranked as one the best bass fishing lakes in U.S. However, its Largemouth Bass population fluctuates in response to large-scale changes in water level. Largemouth Bass harvest can be very high at the reservoir; nearly 20,000 fish were harvested by non-tournament anglers from January to June in 2011.

MANAGEMENT STRATEGIES

1. Conduct spring and fall electrofishing surveys every two years to better monitor Largemouth Bass population parameters.
2. Stock 500,000 FLMB fingerlings annually to increase trophy Largemouth Bass potential.
3. Collect fin clips from tournament-weighed fish in spring 2017 for genetic analysis.
4. Explore the effects of alternative harvest regulations, particularly a daily bag limit reduction, using an age-structured simulation model.

ISSUE 2: The TPWD Commission approved an Alligator Gar daily bag limit increase from 1 to 5 fish (effective September 2015) along with a provision to provide a status report on the population and fishery in 2020.

MANAGEMENT STRATEGIES

1. Conduct gill net sampling in 2018 to assess Alligator Gar population size structure and growth.

ISSUE 3: Many invasive species threaten aquatic habitats and organisms in Texas and can adversely affect the state ecologically, environmentally, and economically. For example, zebra mussels (*Dreissena polymorpha*) can multiply rapidly and attach themselves to any available hard structure, restricting water flow in pipes, fouling swimming beaches, and plugging engine cooling systems. Giant salvinia (*Salvinia molesta*) and other invasive vegetation species can form dense mats, interfering with recreational activities like fishing, boating, skiing, and swimming. The financial costs of controlling and/or eradicating these types of invasive species are significant. Additionally, the potential for invasive species to spread to other river drainages and reservoirs via watercraft and other means is a serious threat to all public waters of the state.

MANAGEMENT STRATEGIES

1. Check for presence of Giant salvinia and other aquatic invasive species at reservoir boat ramps during all visits to the reservoir.
2. Coordinate control activities (if needed) with the controlling authority (IBWC) and the Zapata County government.
3. Cooperate with the controlling authority to post appropriate signage at access points around the reservoir.
4. Contact and educate marina owners about invasive species, and provide them with posters, literature, etc… so that they can in turn educate their customers.
5. Educate the public about invasive species through the use of media and the internet.
6. Make a speaking point about invasive species when presenting to constituent and user groups.
7. Keep track of (i.e., map) existing and future inter-basin water transfers to facilitate potential invasive species responses.

Objective-Based Sampling Plan and Schedule

Sport fish, forage fish, and other important fishes : Sport fishes in Falcon Reservoir include Largemouth Bass, Blue and Channel catfishes, Black Crappie, Alligator Gar, and White Bass. Known important forage species include Bluegill and Gizzard Shad.

Survey objectives, fisheries metrics, and sampling objectives:

Largemouth Bass: Largemouth Bass are the most highly sought after sport fish in the Reservoir. This fishery is a popular destination for out-of-state anglers and has been ranked in the top 10 of the 100 Bass fishing lakes as compiled by the Entertainment and Sports Programming Network (ESPN). This reservoir experiences extreme water level fluctuations which influences habitat, and in turn, Largemouth Bass abundance, size structure, and fishing quality. Our objectives are to monitor for changes in the population at various water levels/habitat conditions and to assess the quality of the fishery on a routine basis with creel surveys. In the past, the population has been sampled biennially with spring and fall electrofishing to track trends in abundance, size structure, and growth. Continued biennial sampling is needed to track changes in the population because of its fluctuating nature and to address management questions and issues as they arise. The sampling will consist of spring day time Bass-only electrofishing and fall all-species daytime electrofishing surveys. The surveys will consist of 24 randomly selected stations. This level of effort should allow the collection of ≥50 stock-size bass for size structure determination, result in RSE's ≤25 for stock CPUE, and collect 13 fish between 13.0 and 14.9 inches for age and growth analysis. In the past, the average number of stations to achieve RSE ≤25 was 15 for spring and 17 for fall. We chose a total of 24 stations to sample because an overnight stay is required for a Falcon electrofishing survey due to its distant location from the office (4 h drive), and 15-17 stations may not provide sufficient fish for the above-described objective to collect 13 fish between 13.0 and 14.9 inches. In the past, the fishery has been assessed about every four years with a 6-month creel survey to estimate targeted angling effort, catch, harvest, and size of fish harvested. Creel survey sampling will be conducted January-June 2016 (report year) and 2019 (non-report year). See Table 15 for full sampling schedule.

Blue and Channel Catfishes: According to recent creel survey results, catfishes provide a nominal fishery at Falcon Reservoir (4.8% of total effort). Our objective is to continue to monitor for large-scale changes in the fishery. This will be accomplished by conducting a creel survey in 2016 and 2019.

Black Crappie: Black Crappie historically provided a fishery at the reservoir; however recent creel survey results show this species accounted for <1.0% of total effort. Our objective is to continue to monitor for large-scale changes in the fishery. This will be accomplished by conducting a creel survey in 2016 and 2019.

Alligator Gar: The Alligator Gar harvest regulation for Falcon Reservoir changed from a 1fish to a 5 fish daily bag limit September 1, 2015. Our objective is to collect population size structure, age distribution, and angler utilization data to determine the effects of the bag limit increase. Gill net surveys will be conducted in April and September of 2018 to collect size and age data for comparison to pre-regulation change data. Our target is to collect 200 fish. Otoliths will be removed from 5 fish/10 cm size group for fish ageing. Two sampling events, each three days in duration, will be the minimum and maximum sampling effort. Directed angling effort, angler harvest, and size at harvest will be collected as part of the 2016 and 2019 creel surveys.

Gizzard Shad and Bluegill: Gizzard Shad and Bluegill are the primary forage fishes at Falcon Reservoir. The CPUE of both species is highly variable, but major changes in their relative abundances may be indicated in CPUE trend data. Sampling of these species will be done concurrently with Largemouth Bass sampling. No additional effort will be expended to increase the number of Bluegill or Gizzard Shad collected.

White Bass: White Bass historically provided a fishery at the reservoir, however recent creel survey results show this species accounted for <1.0% of total effort. Our objective is to continue to monitor for large-scale changes in the fishery. This will be accomplished by conducting a creel survey in 2016 and 2019.

Low-density fisheries: None

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Water Level

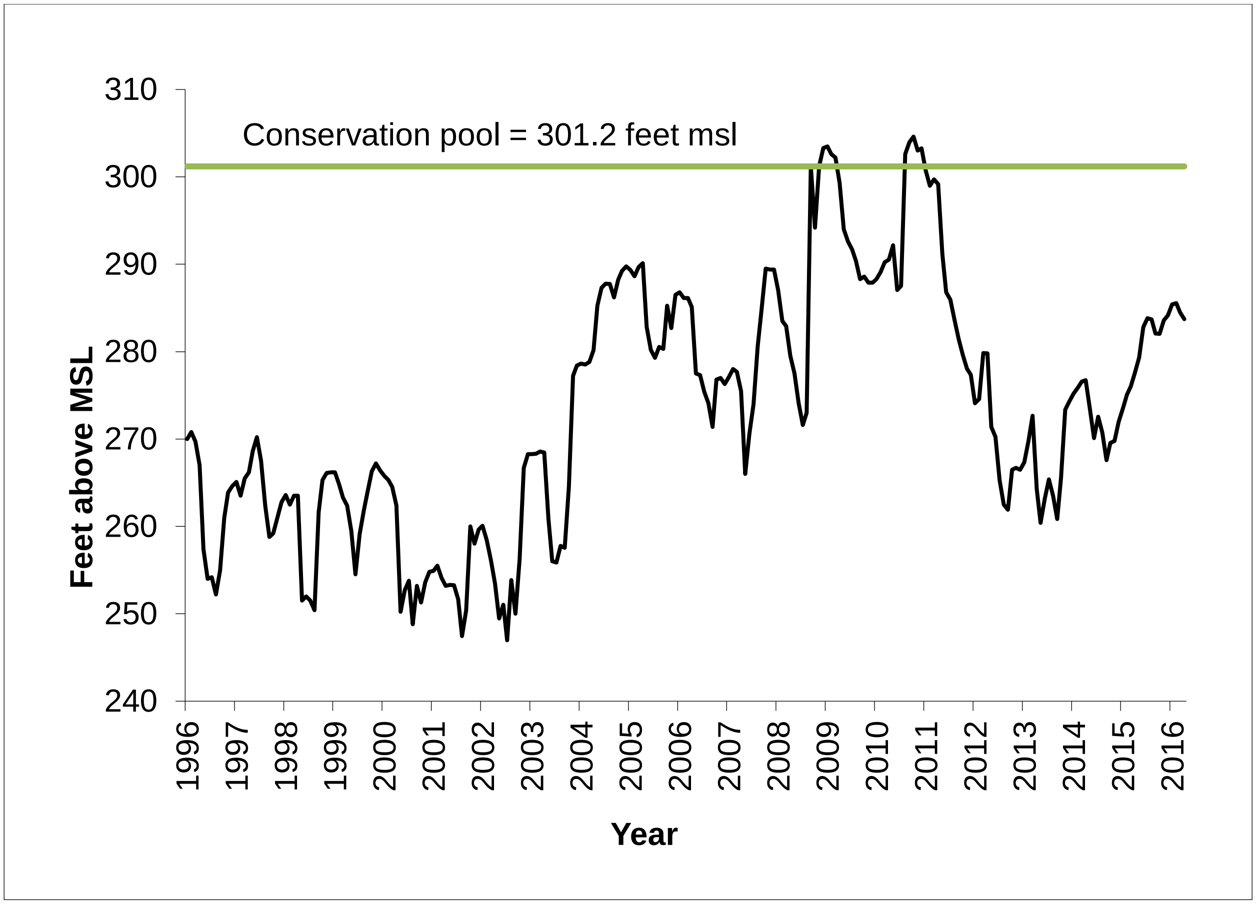


Figure 1. Average monthly water level elevations in feet above mean sea level (MSL) for Falcon Reservoir, Texas, from January 1996 to April 2016.

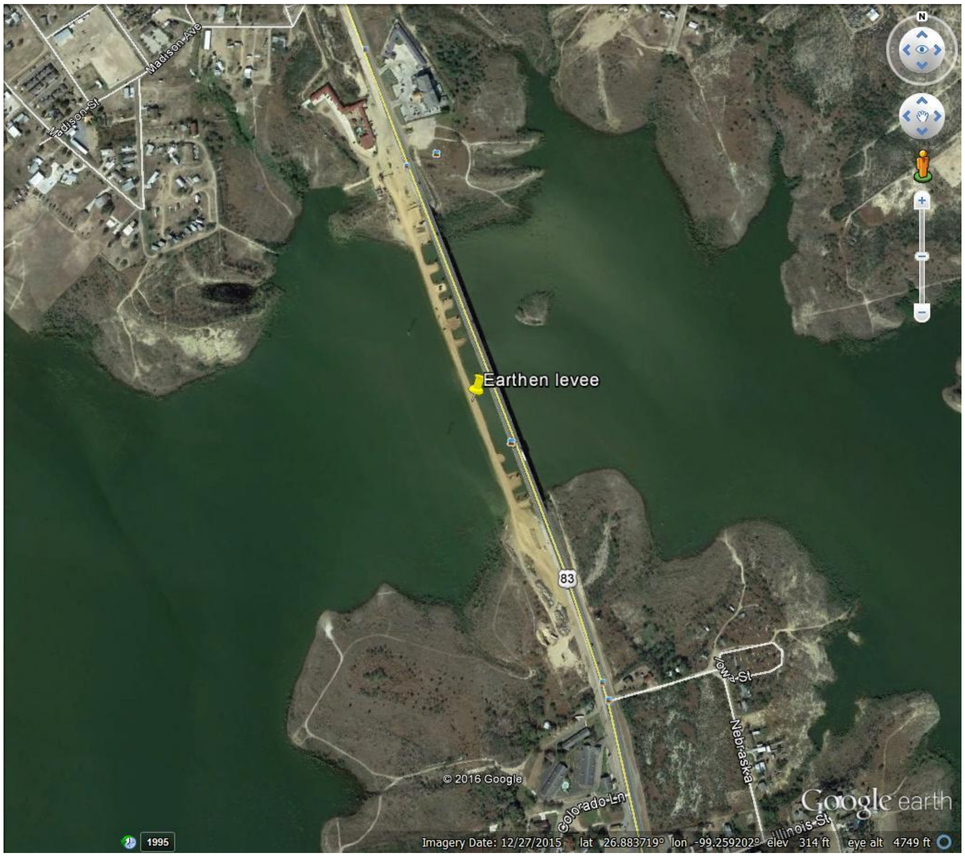


Figure 2. Photos of the earthen construction levee that prevents navigation under the Highway 83 Bridge, April 2016, Falcon Reservoir, Texas.

Table 1. Characteristics of Falcon Reservoir, Texas.

Characteristic	Description
Year constructed	1954
Controlling authority	International Boundary and Water Commission
Counties	Zapata and Starr
Reservoir type	Mainstream
Shoreline Development Index (SDI)	10.64
Conductivity	712 umhos

Table 2. Boat ramp characteristics for Falcon Reservoir, Texas, September, 2015. Reservoir elevation at time of survey was 282.0 feet above mean sea level.

Boat ramp	Latitude Longitude (dd)	Public	Parking capacity (N)	Elevation at end of boat ramp (ft)	Condition
Zapata County Ramp	26.86156 –99.2622	Y	50-100*	unknown	Adequate
Falcon State Park	26.58721 −99.15250	Y	61	unknown	Adequate

*water level dependent

Table 3. Harvest regulations for Falcon Reservoir, Texas.

Species	Bag limit	Minimum length limit (inches)
Gar, Alligator	5	none
Catfish: Channel and Blue catfish, their hybrids and subspecies	25 (in any combination)	12
Catfish, Flathead	5	18
Bass, White	25	10
Bass, Largemouth	5	14
Crappie: White and Black crappie, their hybrids and subspecies	25 (in any combination)	10

Table 4. Stocking history of Falcon Reservoir, Texas. FRY=Fry; FGL = fingerling; AFGL = advanced fingerling; ADL = adults; UNK=Unknown.

Year	Number	Size	Year	Number	Size
	Rainbow Trout			Smallmouth Bass	
1994	2,012	ADL	1984	20,265	FGL
1996	1,743	ADL			
1997	1,335	ADL		Largemouth Bass	
1999	1,255	ADL	1984	6,000	ADL
	6,345		1989	219,316	FGL
			2004	174,241	FGL
	Blue Catfish			399,557	
2003	28,043	FGL			
				Florida Largemouth Bass	
	White Bass		1975	750,000	FGL
2003	29	ADL	1976	2,250	FGL
2004	110	ADL	1978	451,049	FGL
2007	9,048	FRY	1979	131,455	FGL
2008	125,187	FRY	1981	67,000	FGL
2009	1,162,094	FRY	1984	18,375	FGL
	1,296,468		1985	102,000	FGL
			1989	117	ADL
	Striped Bass		1997	501,783	FGL
1976	149,804	UNK	2001	131,021	FGL
1977	725,692	UNK	2003	313,739	FGL
1978	186,287	UNK	2004	185	ADL
1979	174,638	UNK	2004	664,165	FGL
1983	386,503	UNK	2005	11,995	FGL
1988	617,902	FGL	2010	238,244	FGL
1989	4,786,960	FRY	2011	270,159	FGL
1994	685,542	FGL	2012	250,276	FGL
1995	782,685	FGL	2013	514,858	FGL
1997	78,837	FGL	2014	502,052	FGL
1998	78,645	FGL	2015	462,885	FGL
1999	390,919	FGL	2016	507,866	FGL
2000	769,406	FGL		5,891474	
2002	108,027	FGL			
	9,921,847			ShareLunker Largemouth Bass	
			2008	2,842	FGL
			2010	2,091	FGL
	Palmetto Bass		2011	30,488	FGL
1984	222,174	FGL	2012	25,067	FGL
1987	665,000	FRY	2013	4,315	FGL
	887,174			64,803	
	Bluegill			Walleye	
2003	215,718	FGL	1975	447,184	UNK
			1976	4,830,000	UNK
			1977	1,706,600	UNK
				6,983,784	

Table 5. Objective-based sampling plan components for Falcon Reservoir, Texas, 2015-2016.

Gear/target species	Survey objective	Metrics	Sampling objective
Electrofishing			
Largemouth Bass	Abundance	CPUE – stock	RSE-Stock ≤ 25
	Size structure	PSD, length frequency	N ≥ 50 stock
	Age-and-growth	Age at 14 inches	N = 13, 13.0 – 14.9 inches
Bluegill	Abundance	CPUE – Total	none
	Size structure	Length frequency	none
Gizzard Shad	Abundance	CPUE – Total	none
	Size structure	Length frequency	none
	Prey availability	IOV	none
Creel[a]			
Largemouth Bass	Angling effort	Hours	RSE ≤25
	Catch and harvest	Number of fish	RSE ≤50
	Size	Length frequency	N > 100 fish
Blue and Channel Catfish	Angling effort	Hours	RSE ≤50
	Catch and harvest	Number of fish	none
	Size	Length frequency	none
Black Crappie	Angling effort	Hours	None
	Catch and harvest	Number of fish	None
	Size	Length frequency	None
White Bass	Angling effort	Hours	None
	Catch and harvest	Number of fish	None
	Size	Length frequency	None
Alligator Gar	Angling effort	Hours	None
	Harvest	Number of fish	None
	Size	Length frequency	None
Gill nets			
Alligator Gar	Size structure	Length frequency	N ≥200 fish
	Age and growth	Length at age, age distribution	3 fish/10 cm group/sex

[a] 32 creel days from January 1 to June 30.

No additional electrofishing, creel, and gill net sampling effort will be expended to achieve sampling objectives.

Table 6. Results of random point sampling habitat surveys conducted at Falcon Reservoir (Texas-side only) in August-September of 2009, 2013, and 2015. Percent occurrence is shown for predominate habitat types along with lower and upper 95% confidence interval (in parentheses). Reservoir elevation (in feet) relative to conservation pool elevation (301.2 feet above mean sea level) and number of random points sampled are provided for reference.

Habitat type/survey metric	2009	2013	2015
Open water	29 (23-35)	78 (70-85)	60 (54-66)
Flooded terrestrial vegetation	68 (62-74)	22 (15-29)	39 (33-46)
Relative reservoir elevation	-11	-39	-19
Number of random points	382	123	233

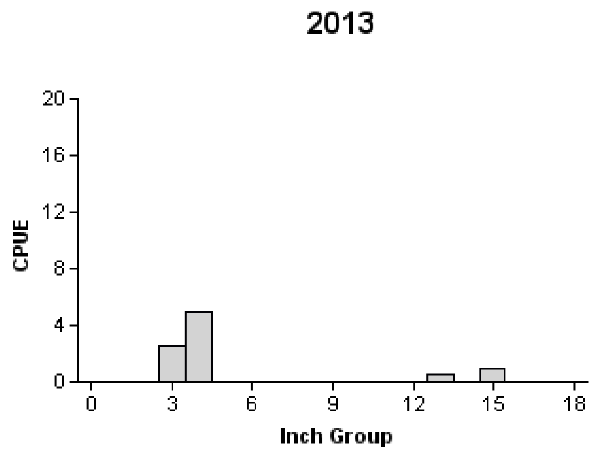
Table 7. Percent directed angler effort by species for Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016.

Species	2006	2011	2016
Catfishes	16.3	4.8	3.5
White Bass	0.0	0.0	0.0
Sunfishes	0.3	0.0	0.0
Largemouth Bass	83.3	91.9	92.7
Black Crappie	0.0	0.4	1.1
Alligator Gar	0.0	0.0	1.4
Anything	0.0	2.8	1.2

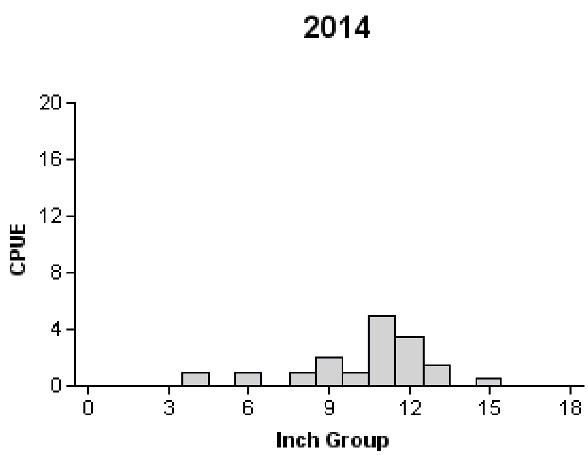
Table 8. Total fishing effort (h) for all species and total directed expenditures ($) for Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Relative standard error is in parentheses.

Creel statistic	2006	2011	2016
Total fishing effort	50,939 (17)	108,427 (24)	119,634 (19)
Total directed expenditures	453,115 (39)	1,289,845 (54)	1,209,834 (28)

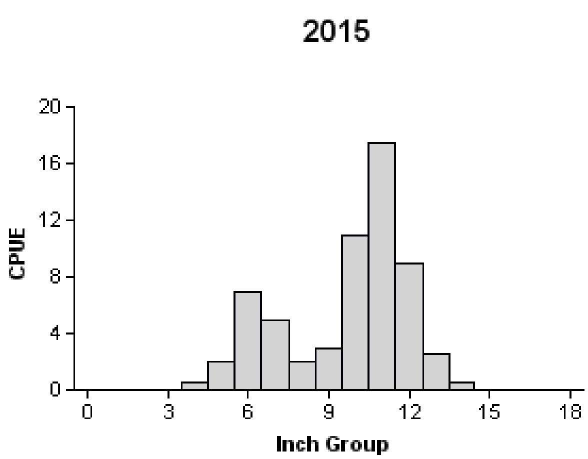
Gizzard Shad



Effort = 2.0
Total CPUE = 9.0 (73; 18)
IOV = 83 (16)



Effort = 2.0
Total CPUE = 16.5 (37; 33)
IOV = 12 (6)



Effort = 2.0
Total CPUE = 60.0 (22; 120)
IOV = 24 (8)

Figure 3. Number of Gizzard Shad caught per hour (CPUE) and population indices (RSE and N for CPUE and SE for IOV are in parentheses) for fall electrofishing surveys, Falcon Reservoir, Texas, 2013, 2014, and 2015.

Bluegill

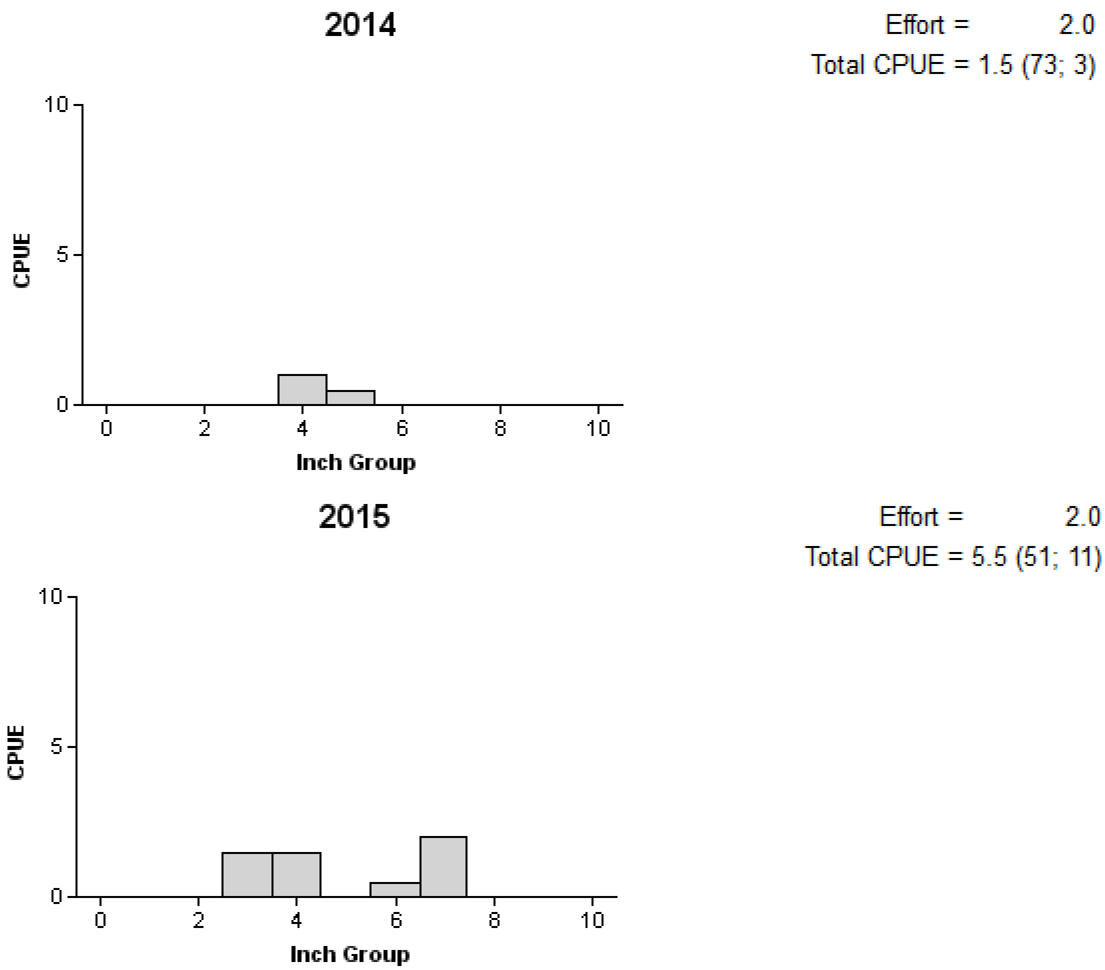


Figure 4. Number of Bluegill caught per hour (CPUE) and population indices (RSE and N for CPUE are in parentheses) for fall electrofishing surveys, Falcon Reservoir, Texas, 2014-2015. No Bluegill were collected during the 2013 electrofishing survey.

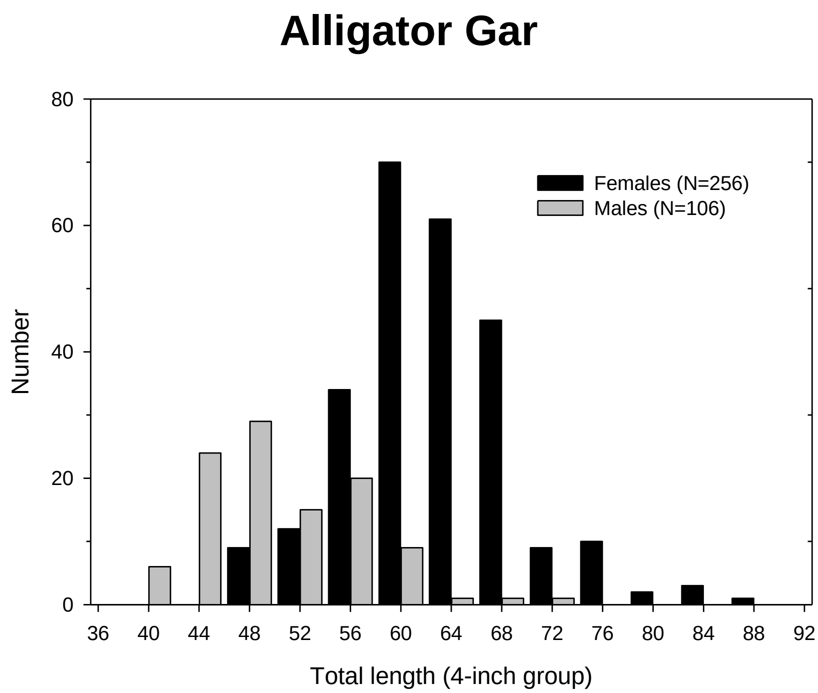


Figure 5. Number of Alligator Gar by size caught in gill nets at Falcon Reservoir, Texas, 2014.

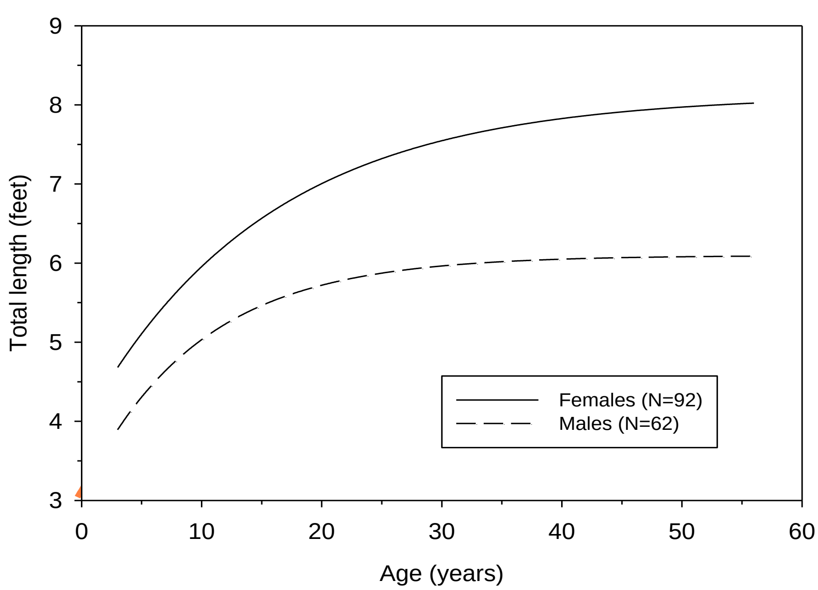


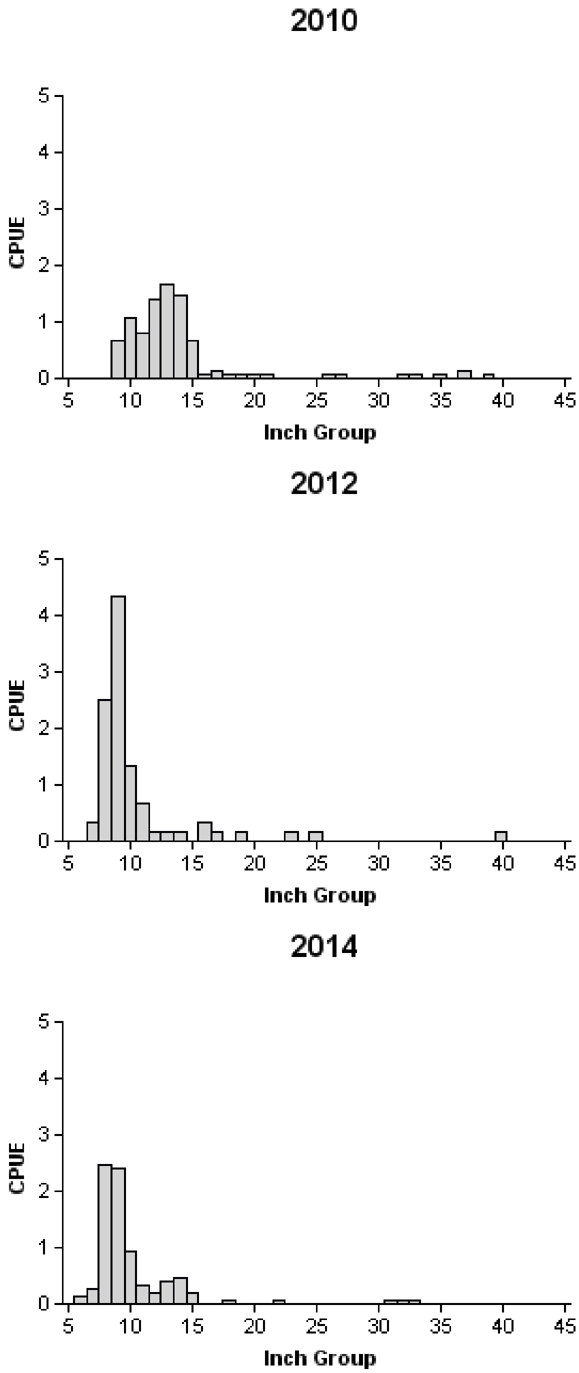
Figure 6. Von Bertanlanffy growth curve for Alligator Gar collected in gill nets from Falcon Reservoir, Texas, 2014.

Alligator Gar

Table9. Creel survey statistics for Alligator Gar Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Relative standard errors are shown in parentheses.

Creel survey statistic	2006	2011	2016
Surface area (acres)	54,882	76,580	57,291
Directed effort total (h)	0	0	1,668 (47)
Directed effort/acre (h)	0	0	0.03 (47)
Average catch per hour	0	0	0.11 (86)
Total harvest	0	0	187 (284)
Harvest/acre	0	0	<0.01
Voluntary release rate (%)	0	0	0

Blue Catfish



2010

Effort = 15.0
Total CPUE = 8.7 (18; 131)
Stock CPUE = 6.2 (16; 93)

2012

Effort = 6.0
Total CPUE = 10.8 (49; 65)
Stock CPUE = 1.7 (30; 10)

2014

Effort = 15.0
Total CPUE = 8.1 (36; 122)
Stock CPUE = 1.6 (26; 24)

Figure 7. Number of Blue Catfish caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Falcon Reservoir, Texas, 2010, 2012, and 2014.

Channel Catfish

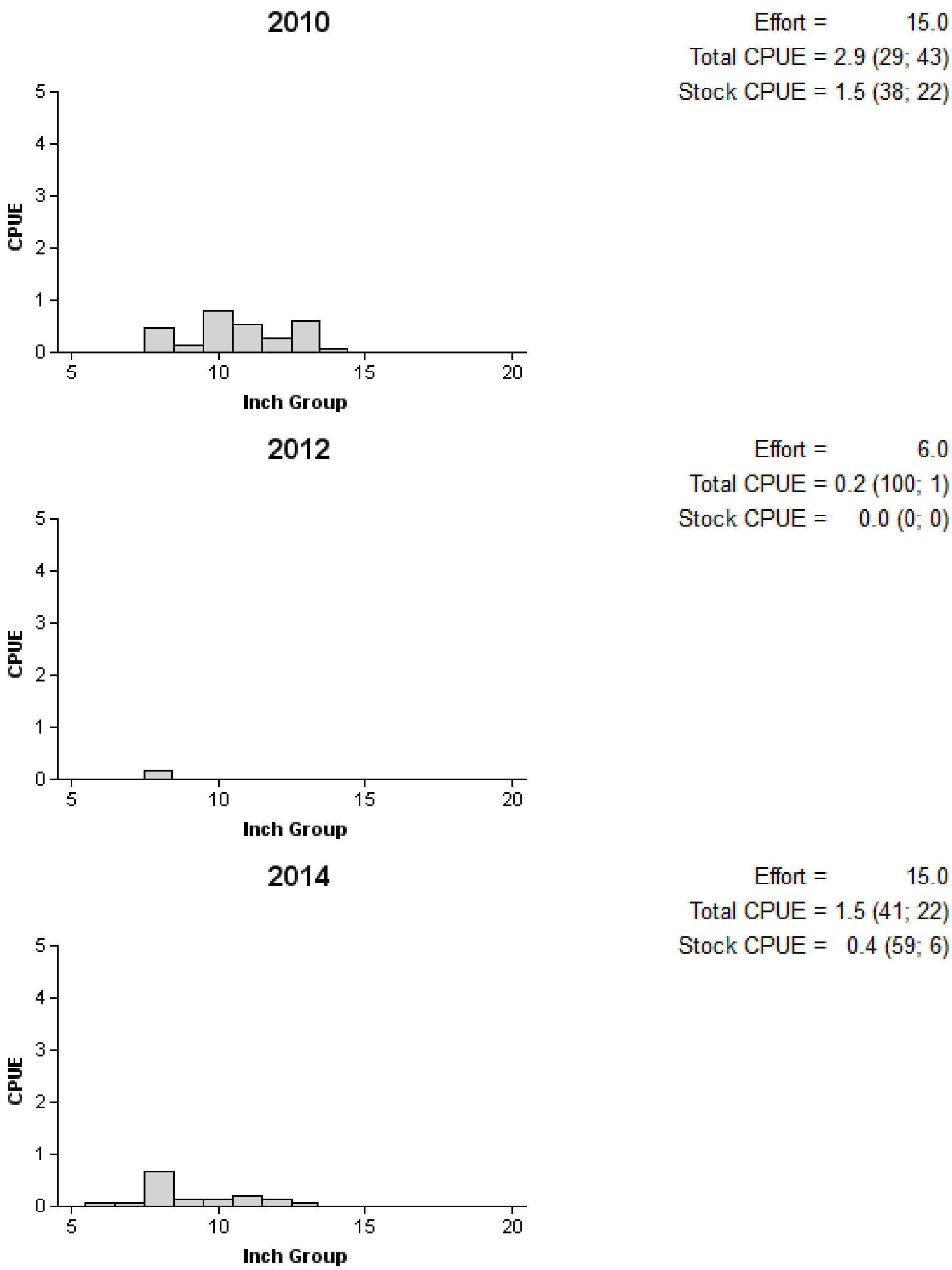


Figure 8. Number of Channel Catfish caught per net night (CPUE) and population indices (RSE and N for CPUE are in parentheses) for spring gill net surveys, Falcon Reservoir, Texas, 2010, 2012, and 2014.

Catfishes

Table 10. Creel survey statistics for catfishes at Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Estimates are for Blue and Channel catfishes combined unless otherwise indicated. Relative standard errors are shown in parentheses.

Creel survey statistic	2006	2011	2016
Surface area (acres)	54,882	76,580	57,291
Directed effort total (h)	8,308 (25)	5,213 (36)	4,224 (33)
Directed effort/acre (h)	0.10	0.06	0.07
Average catch/hour	1.2 (25)	2.7 (36)	0.83 (37)
Total harvest (fish)			
Blue Catfish	3,232 (57)	6,112 (77)	1,423 (74)
Channel Catfish	9,309 (43)	8,664 (63)	688 (102)
Harvest/acre			
Blue Catfish	0.06 (57)	0.11 (77)	0.02 (74)
Channel Catfish	0.17 (43)	0.15 (63)	0.01 (102)
Voluntary release rate (%)	0	0	0

Catfishes

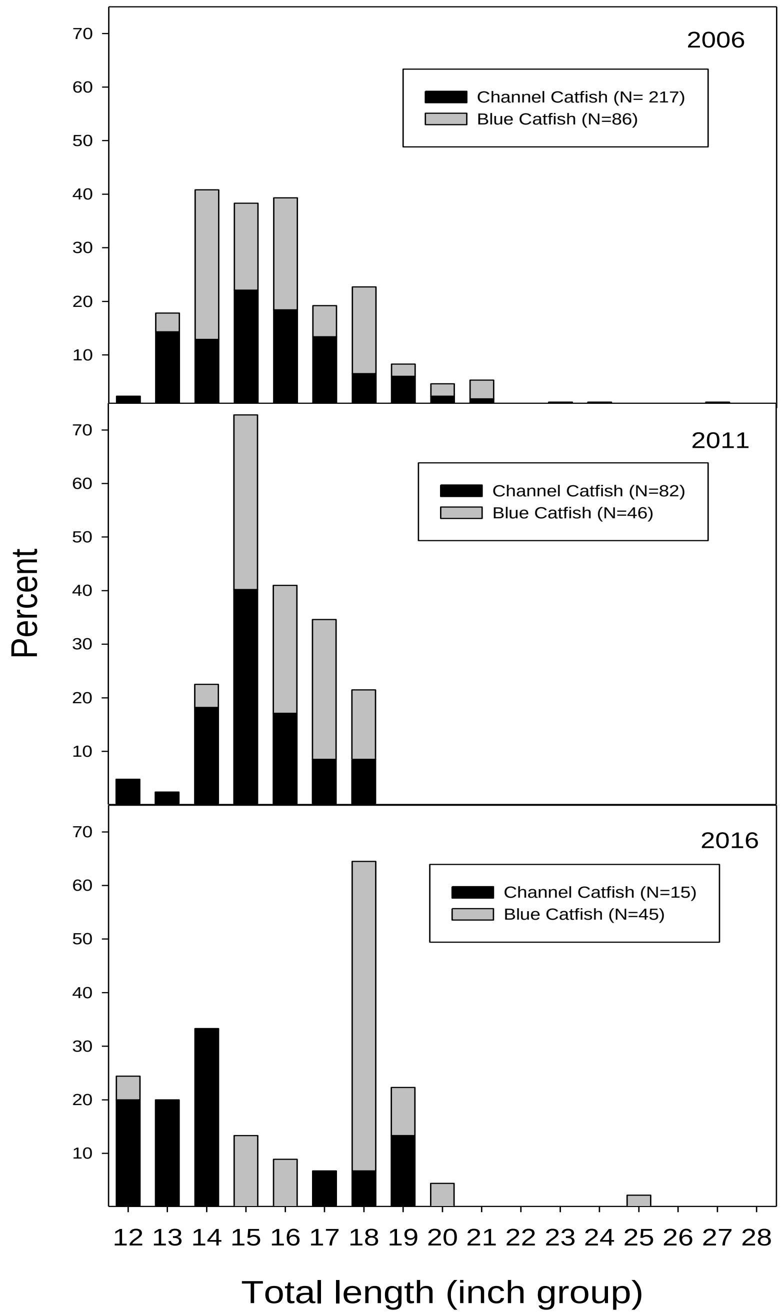


Figure 9. Length frequency distribution of angler-harvested Blue and Channel catfishes measured during creel survey sampling at Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016.

White Bass

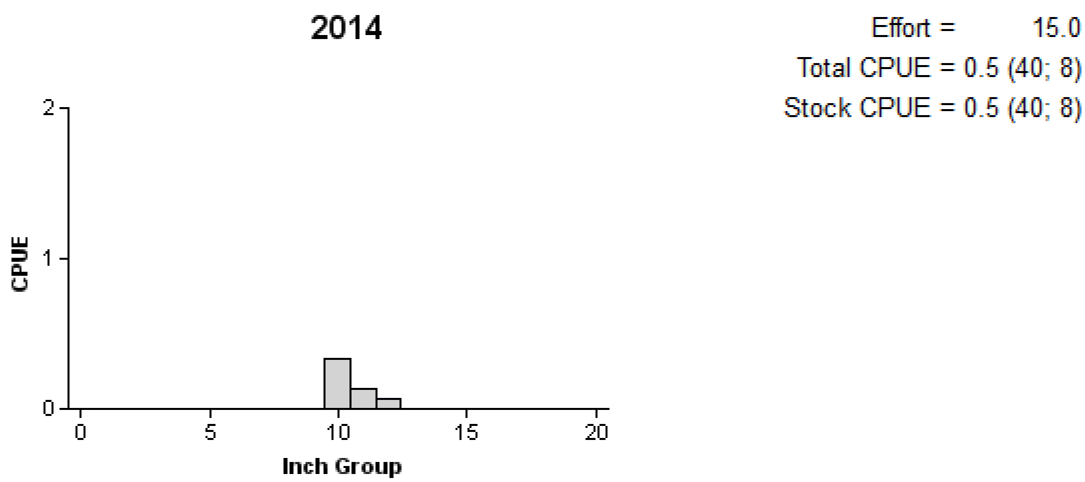


Figure 10. Number of White Bass caught per net night (CPUE) and population indices (RSE and N are in parentheses) for spring gill net surveys, Falcon Reservoir, Texas, 2014. No White Bass were collected in 2010 and 2012.

White Bass

Table 11. Creel survey statistics for White Bass at Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Relative standard errors are shown in parentheses.

Creel survey statistic	2006	2011	2016
Surface area (acres)	54,882	76,580	57,291
Directed effort total (h)	0	0	0
Directed effort/acre (h)	0	0	0
Average catch per hour	0	0	0
Total harvest	0	0	507 (100)
Harvest/acre	0	0	<0.01
Voluntary release rate (%)	0	0	20

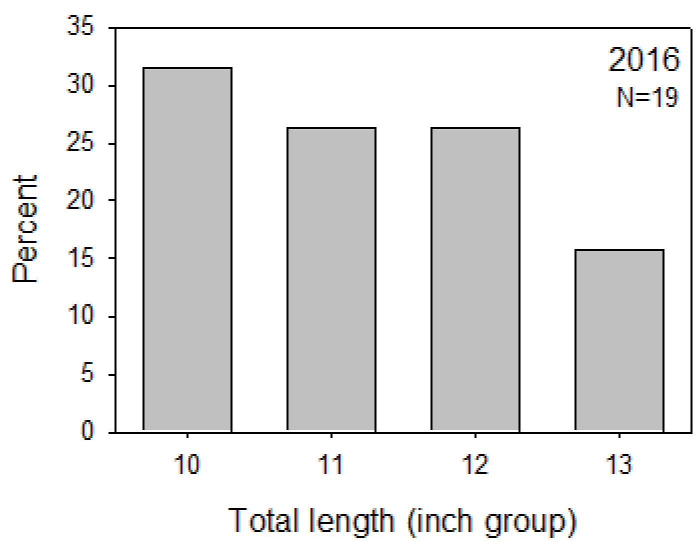
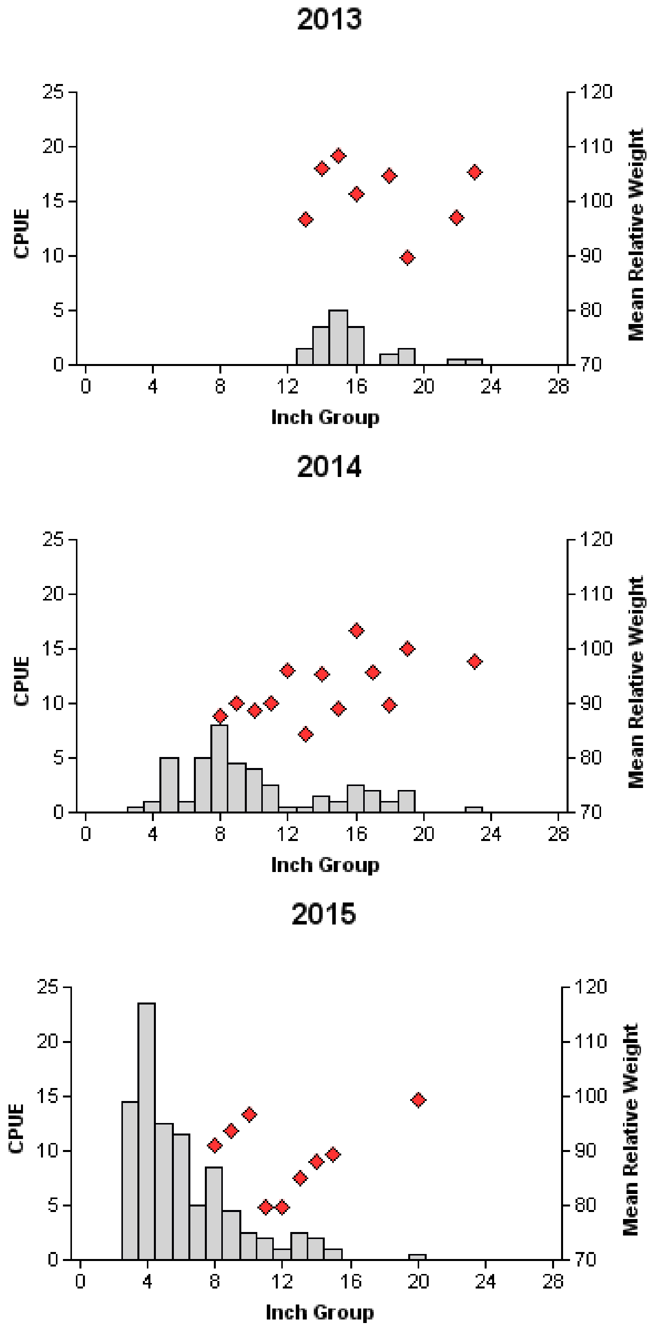


Figure 11. Length frequency of angler-harvested Black Crappie measured during creel survey sampling at Falcon Reservoir, Texas, January 2016 through June 2016, in 2011 and 2016.

Largemouth Bass



2013:

Effort = 2.0
Total CPUE = 17.0 (17; 34)
Stock CPUE = 17.0 (17; 34)
PSD = 100 (0)

2014:

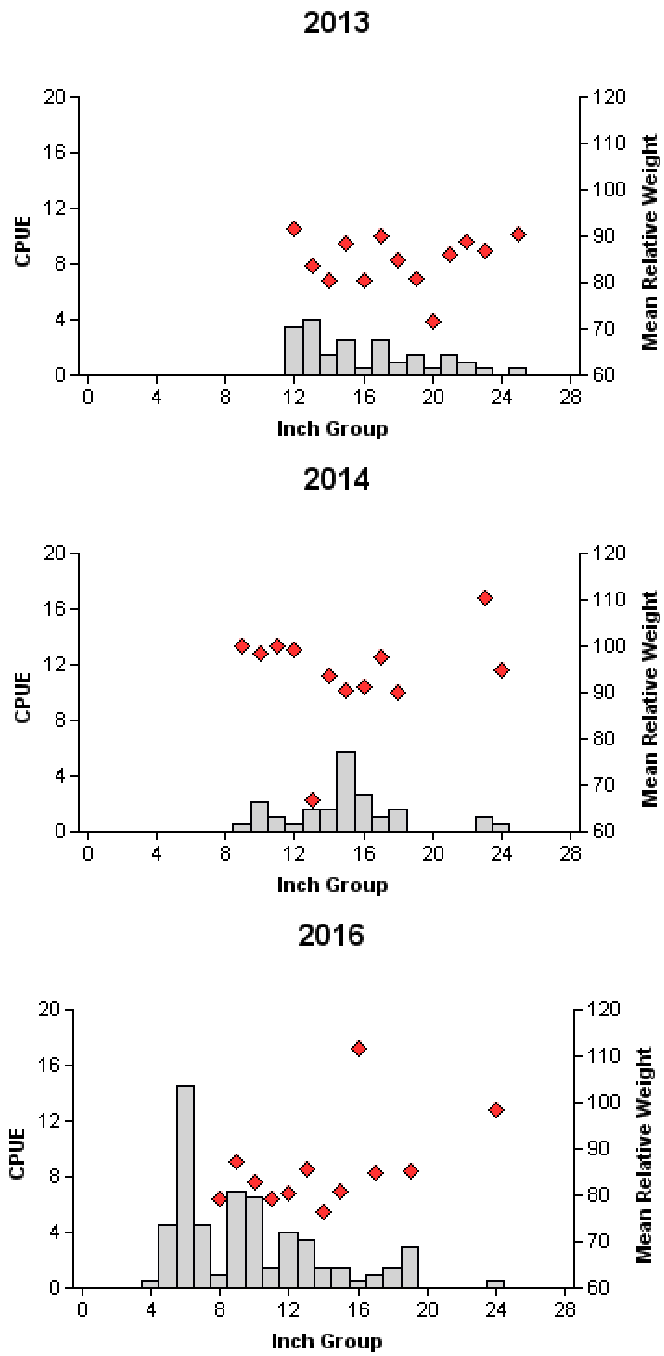
Effort = 2.0
Total CPUE = 43.0 (16; 86)
Stock CPUE = 30.5 (18; 61)
PSD = 38 (11)

2015:

Effort = 2.0
Total CPUE = 91.5 (12; 183)
Stock CPUE = 24.5 (19; 49)
PSD = 29 (5)

Figure 12. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for fall electrofishing surveys, Falcon Reservoir, Texas, 2013, 2014, and 2015.

Largemouth Bass



2013:

Effort = 2.0
Total CPUE = 21.0 (17; 42)
Stock CPUE = 21.0 (17; 42)
PSD = 100 (0)

2014:

Effort = 1.9
Total CPUE = 19.8 (19; 38)
Stock CPUE = 19.8 (19; 38)
PSD = 31 (6)

2016:

Effort = 2.0
Total CPUE = 57.0 (19; 114)
Stock CPUE = 33.0 (17; 66)
PSD = 52 (6)

Figure 13. Number of Largemouth Bass caught per hour (CPUE, bars), mean relative weight (diamonds), and population indices (RSE and N for CPUE and SE for size structure are in parentheses) for spring electrofishing surveys, Falcon Reservoir, Texas, 2013, 2014, and 2016.

Largemouth Bass

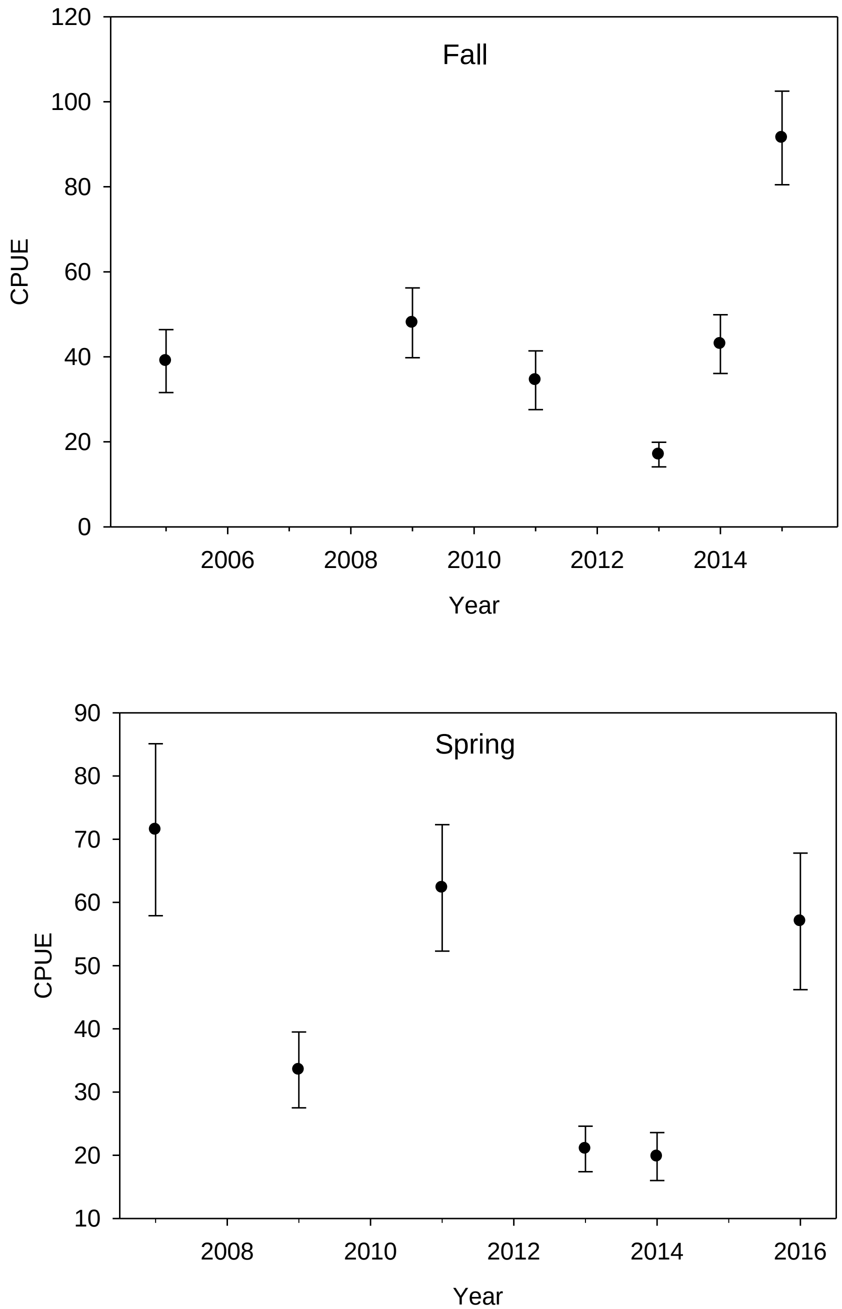


Figure 14. Average number of Largemouth Bass collected per 1 h of electrofishing effort (CPUE) at Falcon Reservoir, 2005-2016. Error bars represent ± 1 standard error.

Largemouth Bass

Table 12. Largemouth Bass creel survey results for Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Relative standard errors, when available, are shown in parentheses. Number released by weight was not available for 2006. Number released by weight estimates for category "<4 lbs in 2011 does not include fish <14 inches total length, but 2016 estimates do include fish <14 inches total length.

Creel survey statistic	2006	2011	2016
Surface area (acres)	54,882	76,580	57,291
Directed angling effort (h)			
Tournament	10,778 (24)	9,336 (40)	22,309 (23)
Non-tournament	31,694 (19)	90,318 (24)	88,621 (19)
Combined	42,472 (18)	99,654 (25)	110,930 (19)
Angling effort/acre	0.72 (18)	1.30 (25)	1.9 (19)
Average catch per hour	1.4 (15)	1.2 (8)	1.02 (9)
Harvest			
Non-tournament anglers	9,839 (41)	19,196 (42)	4,689 (29)
Average harvest/acre	0.18 (41)	0.25 (42)	0.08 (29)
Tournament weigh-in and release	6,649 (47)	7,739 (79)	2,148 (36)
Number released by weight			
Fish <4 lbs		58,453 (30)	100,583 (27)
Fish ≥4 to <7 lbs		17,782 (34)	7,124 (37)
Fish >7 to 10 lbs		3,216 (54)	492 (112)
Fish ≥10 lbs		189 (193)	79 (210)
Voluntary release rate (%)			
Non-tournament anglers	54	78	90

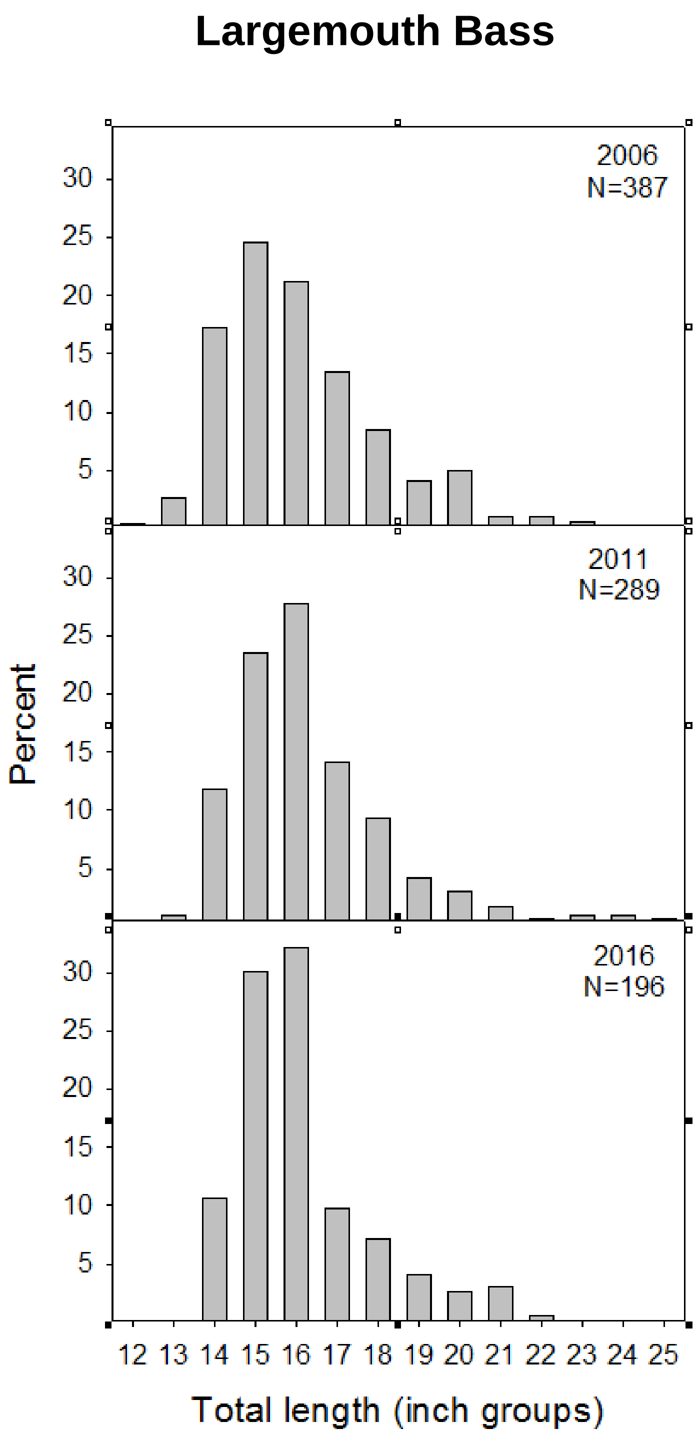


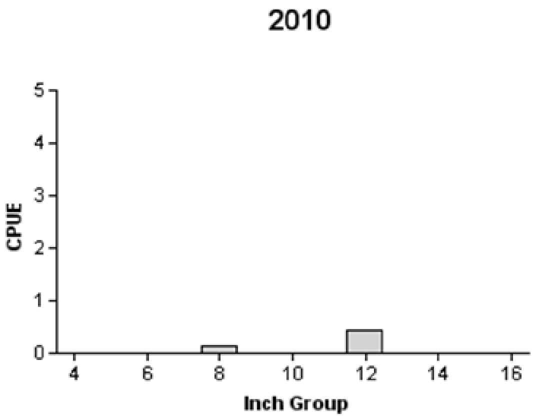
Figure 15. Length frequency distribution of angler-harvested Largemouth Bass measured during creel survey sampling at Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Fish retained by tournament anglers is included.

Largemouth Bass

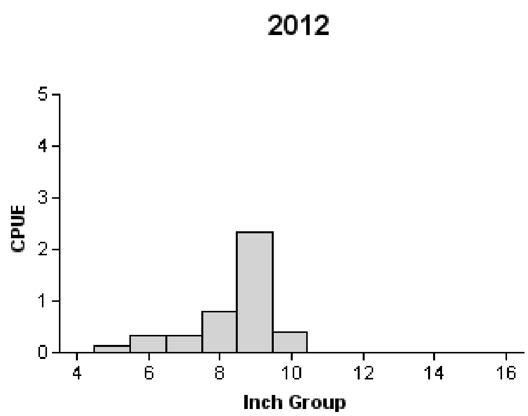
Table 13. Genetic analysis results for Largemouth Bass collected from Falcon Reservoir, Texas. Prior to 2011, fish were collected by electrofishing. Fish collected in 2011 and later were angler-caught. FLMB = Florida Largemouth Bass, NLMB = Northern Largemouth Bass, Intergrade = hybrid between a FLMB and a NLMB. Genetic composition was determined by electrophoresis prior to 2005 and with micro-satellite DNA analysis since 2005. Fish classified as "trophy" weighed ≥10 lbs and were caught by anglers. Fish classified as "control" were random tournament-weighed fish weighing ≤10 lbs.

		Number of fish				
Year/ classification	Sample size	FLMB	Intergrade	NLMB	% FLMB alleles	% FLMB
2000	34	14	20	0	81	41
2001	32	13	19	0	84	42
2005	33	4	29	0	68	12
2009	30	0	30	0	52	0
2011						
Trophy	56	4	52	0	76	7
Control	165	25	140	0	74	15

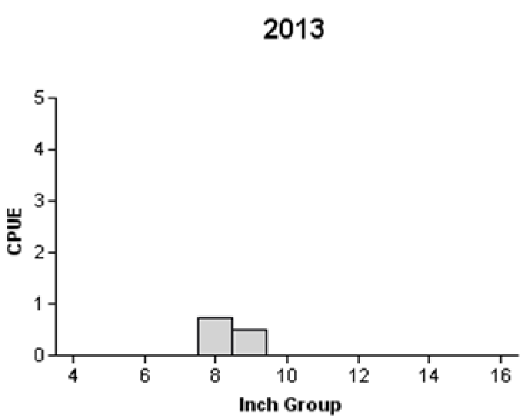
Black Crappie



Effort = 16.0
Total CPUE = 0.6 (88; 9)
Stock CPUE = 0.6 (88; 9)



Effort = 15.0
Total CPUE = 4.3 (44; 65)
Stock CPUE = 4.3 (44; 65)



Effort = 8.0
Total CPUE = 1.3 (39; 10)
Stock CPUE = 1.3 (39; 10)

Figure 16. Number of Black Crappie caught per net night (CPUE, bars), (RSE and N for CPUE in parentheses) for winter trap netting surveys, Falcon Reservoir, Texas, 2010, 2012, and 2013.

Black Crappie

Table 14. Creel survey statistics for Black Crappie at Falcon Reservoir, Texas, from January to June in 2006, 2011, and 2016. Relative standard errors are shown in parentheses.

Creel survey statistic	2006	2011	2016
Surface area (acres)	54,882	76,580	57,291
Directed effort total (h)	0	477 (101)	1,342 (54)
Directed effort/acre (h)	0	<0.01 (101)	0.02 (54)
Average catch per hour	0	1.85 (56)	1.17 (35)
Total harvest	0	2,651 (164)	676 (96)
Harvest/acre	0	0.03 (164)	0.01
Voluntary release rate (%)	0	2	42

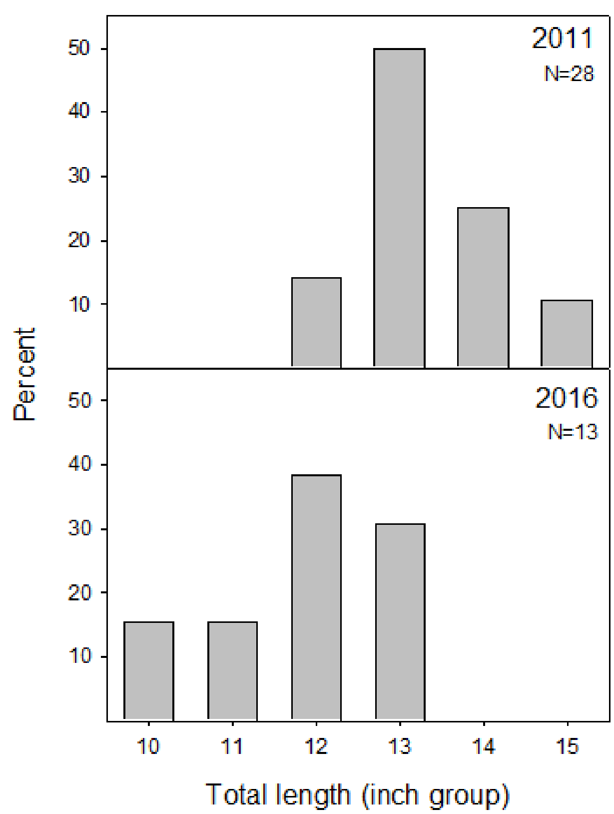
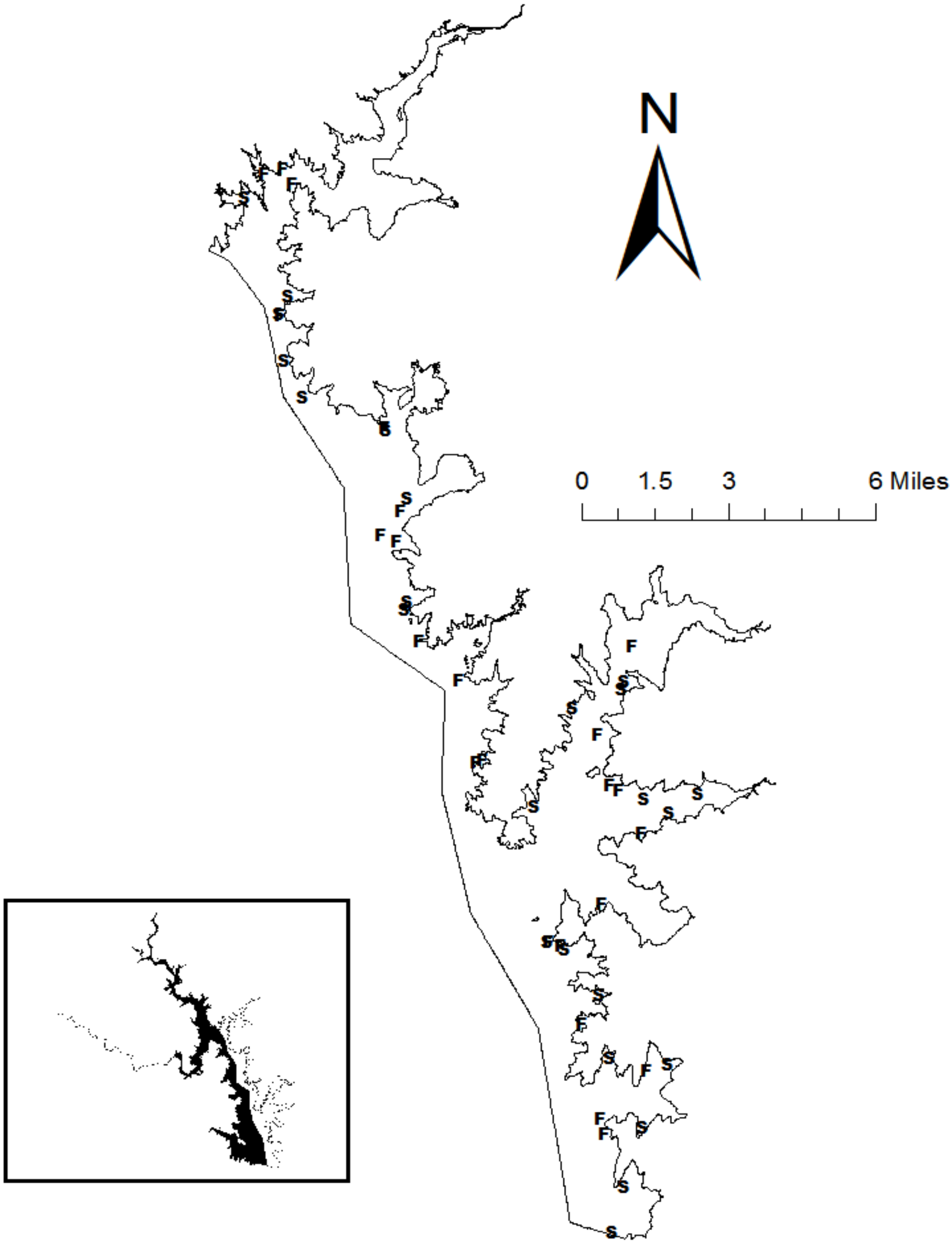


Figure 17. Length frequency of angler-harvested Black Crappie measured during creel survey sampling at Falcon Reservoir, Texas, January 2016 through June 2016, in 2011 and 2016.

Table 15. Proposed sampling schedule for Falcon Reservoir, Texas. Survey period is June through May. Gill netting surveys will be conducted in April and October 2018 and will target Alligator Gar. The creel survey denoted for 2018-2019 will be conducted January-June 2019. Standard survey denoted by S and additional survey denoted by A.

				Habitat				
Survey year	Electrofish Fall(Spring)	Trap net	Gill net	Structural	Vegetation	Access	Creel survey	Report
2016-2017					A			
2017-2018	S(A)		A		S	S		S
2018-2019			A		A		A	
2019-2020	A(A)				S	S		A

APPENDIX A



Location of electrofishing sample sites, Falcon Reservoir, Texas, 2015-2016. Fall and spring sample sites are indicated by “F” and “S,” respectively. Water level was 283.5 feet above mean sea level (MSL) in fall and 284.5 feet above MSL in spring.

APPENDIX B

Number (N) and catch rate (CPUE) of all target species collected during 2015 fall electrofishing, spring 2014 gill netting, and winter 2013 trap netting surveys. Sampling effort was 2 hours of electrofishing, 15 net-nights of gill netting, and 8 net-nights of trap netting.

Species	Fall electrofishing		Gill netting		Trap netting	
	N	CPUE	N	CPUE	N	CPUE
Gizzard Shad	120	60.0				
Threadfin Shad	154	77.0				
Bluegill	11	5.5				
Redear Sunfish	19	9.5				
Blue Catfish			122	8.1		
Channel Catfish			22	1.5		
White Bass			8	0.5		
Largemouth Bass	183	91.5				
Black Crappie					10	1.3
Blue Tilapia[1]					151	18.8

[1]not a target species